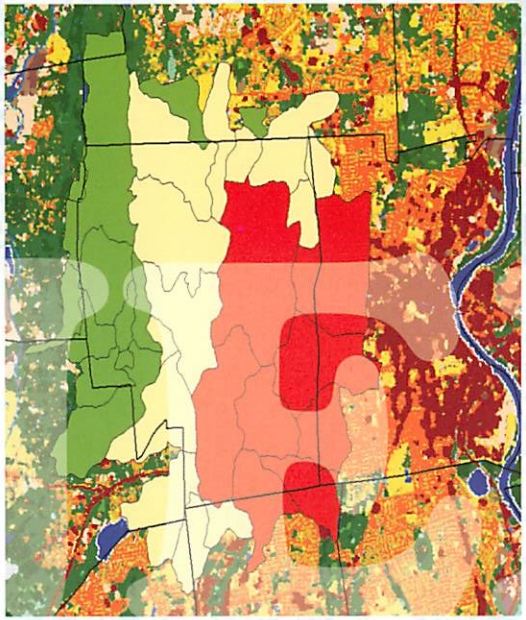
Putting Communities in Charge



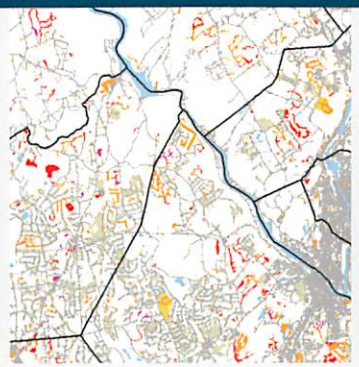
A progress report on an educational support system for local land use decision makers

Nonpoint Education for Municipal Officials

NEMO

A program of the University of Connecticut Cooperative Extension and Sea Grant

About This Report



(Photos from left): Pervious parking area at Cornfield Point, Old Saybrook; Land cover change map for southwestern CT (new development since 1985 in color); Researchers Dan Civco (UConn) and Martha Gilmore (Wesleyan Univ.) collect tidal marsh field data; Water quality grass swales and pervious paver roadway at the Jordan Cove research and demonstration subdivision, Waterford; Stonington Stormwater Task Force meeting; Stormwater retention basin serving Walmart shopping center, Waterford.

This report describes the methods, projects and impacts of the NEMO (Nonpoint Education for Municipal Officials) Program of the University of Connecticut.

NEMO was created in the early 1990's to provide information, education and assistance to local land use boards and commissions on how they can accommodate growth while protecting their natural resources and community character. The program was built upon the basic belief that the future of our communities and environment depend on land use, and, since land use is decided primarily at the local level, education of local land use officials is the most effective, and most cost-effective, way to bring about positive change.

NEMO was unique and innovative in several ways: in its use of geographic information system and remote sensing technology as educational tools; in its promotion of land use planning rather than mechanical devices as the primary weapon against water pollution, and; in its steadfast focus on local land use decision makers as the primary target audience. More than a decade later, these concepts are not nearly so radical, and communities across the state are changing the way they plan, regulate and build their landscapes—assisted by the information and education of the NEMO Program.

The bulk of this report contains examples of these actions, taken from the many towns that have worked with NEMO over the past decade. Although NEMO has catalyzed the action taken by these towns, it is important to remember that the volunteers serving on a town's boards and commissions create the actual on-the-ground impacts. It is to these individuals that we dedicate this publication.

Please read on to learn more about what those towns have accomplished, and how NEMO continues to work "one town at a time" to help improve Connecticut's landscapes.

John Rozum, CT NEMO Director

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Written and edited by John Rozum and Chester Arnold, CLEAR Associate Director. Design and production management by Kara Bonsack, National NEMO Network Communicator. Photography by the NEMO Team except where indicated. Printing of this report funded by CT DEP Nonpoint Source Program.

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The authors would particularly like to thank Laurie Giannotti, who served as Coordinator for the program from 1997 to 2003, and NEMO Co-founder Jim Gibbons. Much of the work that is highlighted in these pages is due to their tireless efforts and dedication.

Finally, we would like to thank the many town staff and volunteers who have spent their own time not only assisting their towns, but also helping us assemble this document. We especially would like to thank: Christine Nelson (Old Saybrook); Tom Wagner and Maureen Fitzgerald (Waterford); Jean Pillo (Woodstock); Mary Ann Chinatti (Salem); Virginia Mason and Glenda Prentiss (COGCNV); Mary Barton (Watertown); Larry Marsicano (Candlewood Lake Authority); and Jason Vincent, Joe Bragaw and Alisa Morrison (Stonington).

About the NEMO Program

John Rozum, CT NEMO Director, gives a presentation to the town of Killingworth, as part of the 2004 Municipal Initiative.

A Quick History

The NEMO Program was created in 1991 at the University of Connecticut, as a collaboration of the Cooperative Extension System, the Connecticut Sea Grant College Program and the Natural Resources Management and Engineering Department. NEMO was created in recognition of the relative lack of education and assistance available for community land use decision makers. Local land use decisions are a key determinant of the social, economic and environmental health of our communities, yet our local decision makers are volunteers with little or no training in land planning or natural resource protection.

The original NEMO pilot project was an outgrowth of the Long Island Sound Study National Estuary Program. With a grant from USDA, UConn staff developed a presentation that used remote sensing and geographic information system (GIS) technologies to inform local land use decision makers about the links between land use and water quality. The original project focused on three pilot communities along Connecticut's coast, but within a few years, NEMO had evolved into a program responding to requests from communities across the state.

NEMO Partners

Although the program still responds to requests, in 2000 NEMO's methods changed when NEMO staff and partners from the Connecticut Department of Environmental Protection (CT DEP) created the Municipal Initiative. For the Initiative, one town in each of Connecticut's

The Coastal Community Development Program

The Coastal Community Development Program (CCDP) of Connecticut Sea Grant (CTSG) was created in 2002, as part of a national effort within the Sea Grant network. As with each of the Sea Grant programs nationally, CTSG receives $50,000 per year to be applied directly to research, education and outreach focused on coastal communities. While a variety of issues are addressed by these programs, a strong common denominator is the impact of urbanization on coastal resources, economies and health.

Sea Grant Connecticut

With a long history of community-oriented work to its credit, CTSG was able to hit the ground running. By 2002, Sea Grant and the Department of Extension had been partners for over a decade on the NEMO Program. In fact, with its successful track record in Connecticut and its adoption by Sea Grant programs in many other states, NEMO was the original inspiration for the creation of the national CCDP.

CTSG invests its CCDP funding in the NEMO Program to develop new programs and tools specific to the coast, and to leverage statewide NEMO programs and services to the benefit of Connecticut's coastal communities. CCDP-related NEMO activities include the new *Focus on the Coast* educational program (see page 33), targeted work with selected coastal communities and special remote sensing research focused on invasive coastal plants and coastal urbanization.

five major watersheds is selected each year to work with the NEMO Team on an intensive basis (see box, right). In 2002, NEMO renewed its original partnership with Connecticut Sea Grant through the Coastal Community Development Program (see box, left). These partnerships provide both financial support and institutional frameworks for NEMO's work in Connecticut.

Our Shop

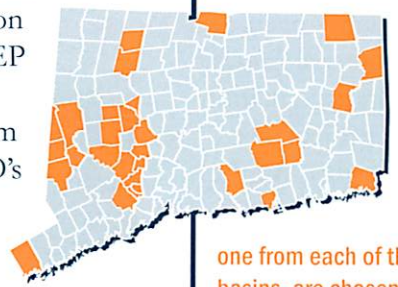
NEMO has remained "lean and mean" throughout the years, with only two full time staff members, the CT NEMO Director and a GIS/ Remote Sensing Specialist, both operating out of the Middlesex County Extension Center in Haddam, CT (see pg. 3 to contact the NEMO Team). In addition to our partners at CT DEP and Sea Grant, programmatic support comes from collaboration with NEMO's closely associated sister programs of the new UConn Center for Land Use Education and Research (CLEAR), including the Community Land Use Planning Program and the Geospatial Technology Program (GTP) (see The NEMO Family, page 31).

The Municipal Initiative Program

Former CT NEMO Coordinator Laurie Giannotti (front row, center) with members of the Old Saybrook NEMO Task Force at the "low impact" model subdivision.

In 2000, NEMO staff, in collaboration with the Nonpoint Source Section of the CT DEP, developed the Connecticut Municipal Initiative. The Municipal Initiative allows the NEMO Team to focus more resources on fewer municipalities, establishing relationships between the program and these towns from the initial educational workshop through implementation of on-the-ground changes.

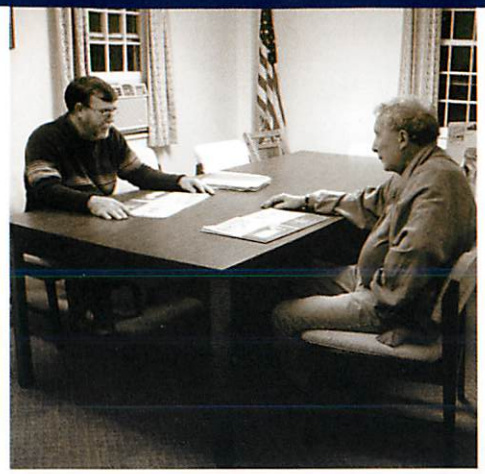
Each year, NEMO distributes a Request for Proposals to all 169 towns in Connecticut, soliciting admission into the Municipal Initiative. The one-page application form is quite simple, but its purpose is to have municipalities commit to the process of working with the University as partners on a long-term educational program with specific goals. Three to five municipalities, one from each of the major Connecticut river basins, are chosen each year (CT map shows all Municipal Initiative towns in orange).



Selected towns must designate a contact person for the program who will be responsible for facilitating communication both between the program and the town, and among various bodies within the town. In addition, a NEMO Task Force must be established whose membership includes, at a minimum, members of the following commissions or boards: planning, zoning, inland wetlands, conservation and the office of the chief elected official (town council; board of selectmen, mayor's office). Other groups, such as town departments, land trusts and economic development commissions are also encouraged to participate.

Task Force and NEMO staff agree on a list of specific town objectives, drawn from the general categories suggested by NEMO but heavily influenced by the needs and interests of the town. In addition to the educational presentations, NEMO provides support through guidance documents (fact sheets, publications, CD's), internet tools, GIS and remote sensing information and consultation via telephone or meetings.

How NEMO Works



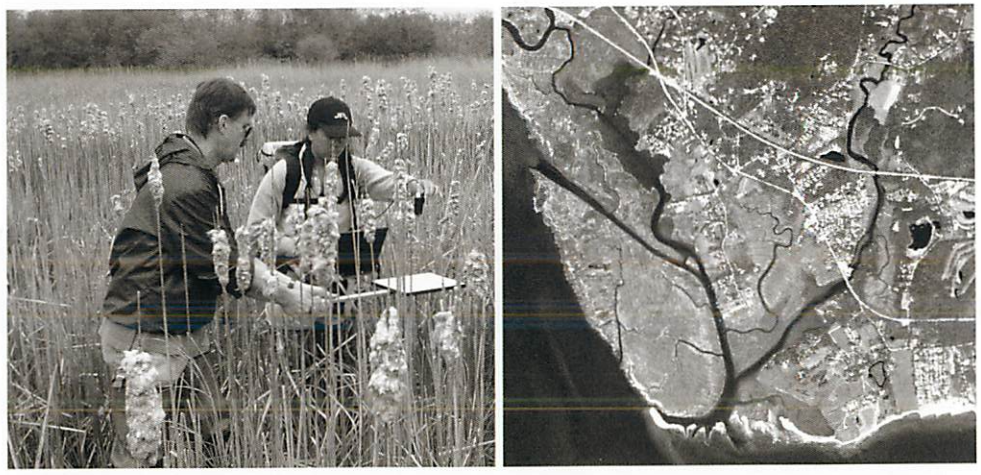
Killingworth town officials view their NEMO informational packets prior to a NEMO presentation.

NEMO uses a combination of sophisticated technology and old-fashioned Extension education to engage its target audience of local decision makers.

Topics and Tools

NEMO's basic educational method is face-to-face workshops for local officials. Over the years, the program's list of workshop topics has been expanded beyond the original *Linking Land Use to Water Quality* presentation developed in the pilot project (see Top 10 Presentations, right). All the topics, however, cover some aspect of natural resource-based land use planning and design—the overall approach promoted by NEMO for communities to guide their future landscape. This approach goes beyond a laundry list of natural resource problems, helping towns identify strategies that address key land use issues.

Research and technology play a large role in NEMO educational programs. Satellite-derived land cover maps are used to better understand landscape patterns. GIS technology, or computerized mapping, is used to create maps and analyses that convey complex information in an intuitive, understandable fashion. The NEMO website is used to display and distribute information, increasingly in an interactive way, through tutorials and web-based GIS mapping. Through this combination of sophisticated technology and old-fashioned Extension education, the program strives to engage its target audience of local land use officials.



(Left photo) Dr. Dan Civco, CLEAR Director, and Dr. Martha Gilmore, Wesleyan University, measure the "spectral signatures" of various tidal plant species, as part of a remote sensing research project for the Long Island Sound Study. (Right photo) Quickbird satellite photo image of the tidal marshes in Old Lyme, Connecticut.

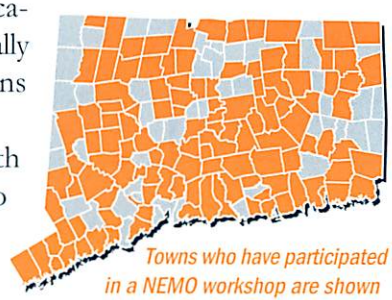
Top 10 Presentations

1. *Linking Land Use to Water Quality*
2. *Reducing Runoff*
3. *Conducting a Community Resource Inventory*
4. *Open Space Planning*
5. *Natural Resource Based Planning for Watersheds*
6. *Focus on the Coast*
7. *Wet Lands*
8. *Clean Waters: Starting in Your Home and Yard*
9. *Site Plan Review*
10. *Managing Stormwater in Urban Areas*

Visit the NEMO website for a complete listing of presentations. nemo.uconn.edu

Traveling to Town Hall

NEMO goes to its target audience. In a typical year program staff might conduct over 100 educational workshops, virtually all evening presentations at community venues. NEMO staff work with community contacts to ensure that the format and audience of the workshop help to maximize the chances for positive follow up. The ideal audience is a group that has representation from all of the local land use boards, as well as municipal departments (planning, engineering, public works) and any interested organizations (land trusts, chamber of commerce). Most workshops are about two hours long—an hour for the presentation and an hour for discussion. To date, three-fourths of the 169 communities in Connecticut have participated in at least one NEMO educational workshop (see map).



Towns who have participated in a NEMO workshop are shown in orange.

CT NEMO Facts

- NEMO has 16 different educational programs covering various aspects of natural resource-based community planning–with more planned.
- NEMO staff give over 100 presentations per year to community officials.
- Workshops have been given in 3/4 of CT's 169 communities (towns in orange on CT map, left).
- NEMO has been designated the CT "smart growth contact" by EPA Region One.
- NEMO has won national awards from the American Planning Association and the National Environmental Education Training Foundation.
- NEMO is the inspiration for, and coordinating center of, the National NEMO Network, currently a group of 34 sister projects in 32 states.
- NEMO's integrated research/outreach model is the foundation of UConn's Center for Land Use Education and Research (CLEAR), created in 2002.

How NEMO Spells Success

Breezy Knoll subdivision incorporates many "low impact" design elements, like a narrow paved roadway and engineered grass swales replacing traditional curb-and-gutter drainage.

So by now you're probably thinking that all these workshops sound great, but is anything getting done out there in the real world?

Yes. Professional outreach education of the type that NEMO offers can be an agent for real change—not just "feel good" fluff. Helping local leaders initiate new processes, or change existing ones, requires the give-and-take of intensive education. The NEMO method creates local ownership of new initiatives and gives institutional memory on these issues a fighting chance, thereby making resultant changes in plans and policies more likely to survive into the future.

The goal of every NEMO workshop is to give local decision makers some tangible action items toward protecting their municipality's resources. These actions span a wide range, from revisions to overall town policies to very specific changes to regulations or development practices. Some examples appear in the table to the right.

Local Actions Catalyzed by NEMO

1. Changes to administrative procedures. These are changes in the way a "town does business" such that the decision-making structure is more conducive to proactive planning.	**Examples** include establishment of a commission or working group or the creation of a GIS department.
2. Research and information gathering. These initiatives provide the local data upon which land use plans and decision can be based.	**Examples** include a community resource inventory, a vernal pool survey or an economic development analysis.
3. Changes to planning documents. Plans are critical documents that provide "big picture" vision, goals and implementation strategies for a community and are the foundation for land use regulations.	**Examples** include changes to the Plan of Conservation and Development, open space plan, economic development plan or watershed plan.
4. Changes to regulations. Regulations provide the "rules" which developers and local decision makers must follow and have the biggest impact on how development will proceed in a town.	**Examples** include zoning, subdivision and road design regulations.
5. Changes to town policies. Policies are essentially the housekeeping procedures of the town and ensure that a town is taking care of its own responsibilities.	**Examples** include road sand sweeping procedures and stormwater infrastructure maintenance.
6. Changes to the landscape. As a result of changes to plans and regulations, the form and function of the landscape—both the built and open portions—is altered to better protect natural resources.	**Examples** include the use of swales, narrower roads, rain gardens, pervious pavements in new developments and permanently preserved land.

Town Profiles

Public access parking stalls at Cornfield Point, Old Saybrook feature alternative pavement that promotes infiltration. Shown here are modular concrete pavers.

Municipal staff at a training class at UConn's Avery Point campus test out the Impervious Surface Analysis Tool (page 33).

Our experience has taught us that Connecticut's communities can do amazing things, given a little information and assistance—and ideas for how to tap into the natural talent that resides in every town.

In the following 20 pages, we profile nine towns, or groups of towns, that have been working with the NEMO Program; at the end, a few additional examples are profiled, as well. These towns have embarked on a variety of planning, regulatory, design and policy initiatives, assisted and catalyzed by NEMO. Each town has taken a slightly different path, and the profiles have been selected to portray the wide range of approaches that can be taken. Taken together, we believe that they give the reader a feel for how much can be accomplished by dedicated town staff and volunteers when they are supported by the right education, information and tools.

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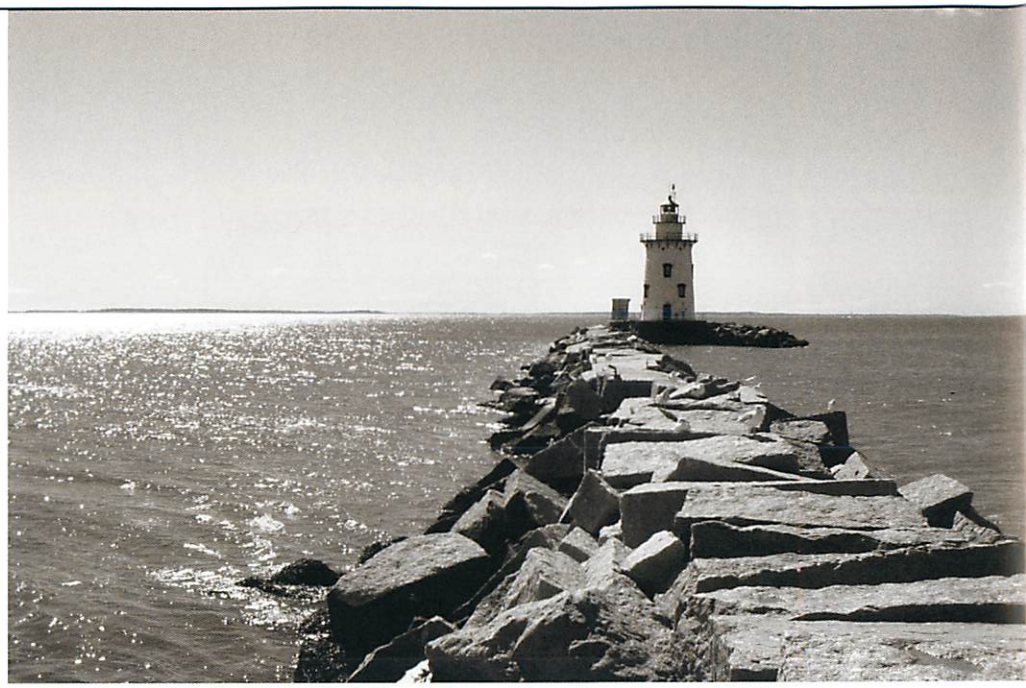
Old Saybrook Town Profile



Old Saybrook is a suburban town that lies at the confluence of the Connecticut River and Long Island Sound. The town's landscape is approximately 30% developed, with much of the undeveloped land either forest or tidal marsh. Old Saybrook has a long history with the NEMO Program, extending back to 1993, when it was one of NEMO's original pilot towns. While some changes to zoning regulations and best management practices were made as a result of NEMO's early work with Old Saybrook, the addition of a full time planner in 1999 and their participation in the Municipal Initiative have allowed for more far-reaching change.

NEMO's Role

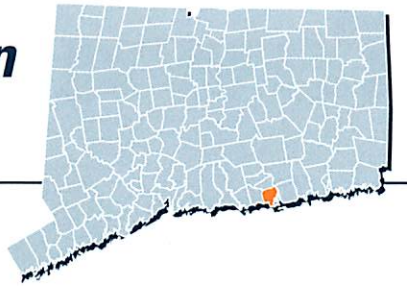
The Old Saybrook NEMO Task Force (photo, page 5), representing each of the land use decision making boards, had their first meeting with staff in January of 2001 to kick off the Municipal Initiative. Town officials were beginning an update to their Plan of Conservation and Development (POCD) and were concerned about both topical issues (water resource protection) and process issues (lack of communication between boards and commissions). The NEMO Team provided a series of workshops that highlighted the responsibilities of commissions and provided ways for commissions to begin the process of planning. NEMO also served as a resource for several intra-commission working groups on specific topics, such as open space preservation and road standards.

Old Saybrook agrees with the NEMO precept that conservation and economic development are often two sides of the same coin. Thus, the Economic Development Commission hosted NEMO's *Sustainable Economic Development* and *Strip Development* workshops as a kickoff to their economic planning initiative.

Old Saybrook's Actions

In 2001, the Board of Selectmen developed and issued an Official Policy Statement that incorporates NEMO's nonpoint source management strategies and supports alternative design standards for site development. In response to this statement the NEMO Task Force, working with town staff, began to revise town road ordinances to allow for alternative stormwater management practices more in line with NEMO principles and the state/federal Phase II Stormwater Management Program. In addition, the Zoning Commission updated its regulations to incorporate

A Full Scale Planning and Design Approach to Stormwater Management



Highlights

- New town road policy
- Zoning changes to limit impervious surfaces
- New natural resource inventory
- New open space plan
- Annual natural resource tour
- Changes to comprehensive plan
- New "residence conservation" district
- Model "low impact" subdivision.

impervious surface limits in their business districts, in order to minimize impacts from development to coastal resources and Long Island Sound.

The Conservation Commission has conducted an inventory of natural resources and open space. This information was the basis for the town's new *Plan of Conservation Areas*, an open space plan that prioritizes critical properties in town and assesses their potential as recreational or conservation lands. The Commission now organizes an annual Old Saybrook Natural Resource Tour, which gives town residents an opportunity to recognize the value of these critical open spaces toward maintaining the town's character. The Conservation Commission is also working with the Planning Commission to insert the open space plan into the updated POCD.

The Planning Commission has incorporated nonpoint source management strategies in the update of its POCD. The Commission provides a number of strategies to meet these goals, including the requirement for detailed stormwater management plans, use of new development techniques such as swales and bioretention, and the protection/enhancement of riparian buffers. The Planning Commission, working with the Zoning Commission, also addressed sections of the subdivision and zoning regulations, designating one of the last undeveloped areas as a Residence Conservation District. This designation requires the use of open space subdivisions for future development proposals, in order to encourage development that preserves the area's natural resources and maintains contiguous open space and wildlife corridors. The Planning and Zoning Commissions work closely with the Conservation Commission in evaluating the appropriateness of open space acquisitions, and whether they meet the standards set forth in the town's *Plan of Conservation Areas*.

Photo courtesy Town of Old Saybrook.

(Lower left photo) Curbless road and swale design in Old Saybrook's model subdivision. (Above) Town Zoning Commissioner reviews plans for the subdivision with a young member of the neighborhood.

As a result of the town's progress, the Planning Commission, in collaboration with the NEMO Task Force, Town Engineer and a local developer, has implemented a model subdivision in town (photo, page 10 and cover). The subdivision incorporates many of the fundamental NEMO principles such as vegetated swales, narrow road widths and clustering to help manage stormwater runoff and reduce nonpoint source pollution. The subdivision has been in place for over four years, and the stormwater elements have worked well and needed little maintenance.

Waterford Town Profile

Waterford is an urban coastal town bisected by Interstates 395 and 95, and surrounding the City of New London from the Thames River to Long Island Sound. The easy accessibility of the town, combined with a quantity of available commercially zoned land, has made the town a regional commercial destination. Several new shopping centers and retail areas have developed over the past few decades. Recent studies show that the town is over 20% developed, an increase in developed land of over 21% from 1985 to 2002. During this period, the town's residential development has increased, in part, due to Waterford's low tax rates. This has increased capital expenditures on water, sewer and road reconstruction.

The town's economic resources also include the Sound with its accompanying tidal wetlands, coastal embayments, estuaries and beaches—all potent attractions for recreational uses like fishing and boating. However, maintaining a balance between natural resources and economic development is difficult when development is on the rise and tax revenues are declining. Balancing economic and natural resources so the success of one will not impair the other, is a significant challenge for the town.

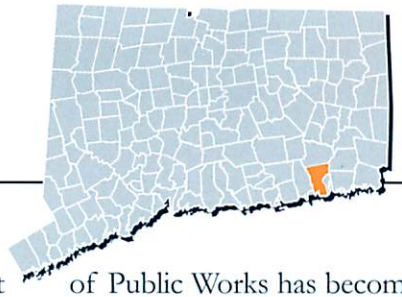
NEMO's Role

Waterford is one of the original NEMO pilot towns. Starting in 1992, NEMO staff held several workshops for town officials including the *Linking Land Use to Water Quality* presentation. "NEMO challenged the way we thought about development," explained Planner Tom Wagner. "We tended to think of development on the site-by-site basis. NEMO helped us to think more comprehensively on the watershed level." NEMO has also been involved as a partner in the Jordan Cove Project.

Waterford's Actions

Commercial development, particularly so-called "big box" retail stores, has become a necessary part of Waterford's economic base. This type of development is also a large potential contributor to stormwater pollution, primarily due to the vast areas of impervious surfaces from parking lots and buildings. Waterford has been a state leader in using innovative techniques to mitigate the effects of these surfaces in commercial settings. When Walmart built a new store in town, the Conservation and Planning and Zoning Commissions approved the use of stormwater wetlands and an open water "wet pond" detention area (photo, right and page 2). The natural cleansing functions of the wetlands and pond treat the most

Leadership in Managing Runoff from Large Commercial Development



Highlights

- Wetland/pond stormwater complexes required for major commercial development
- Zoning changes to lower minimum parking ratios
- Pre-development infiltration levels required for new commercial development
- Encouragement of conservation easements adjacent to development
- New stormwater requirements and water quality review of all proposed development
- National "low impact" design research/demonstration project
- Regular monitoring of stormwater BMPs and major waterways.

polluted "first flush" of stormwater, filtering the pollutants before they are released to a nearby stream. Monitoring data from the outlet and the stream are very positive, showing that this technique has been successful in protecting water quality.

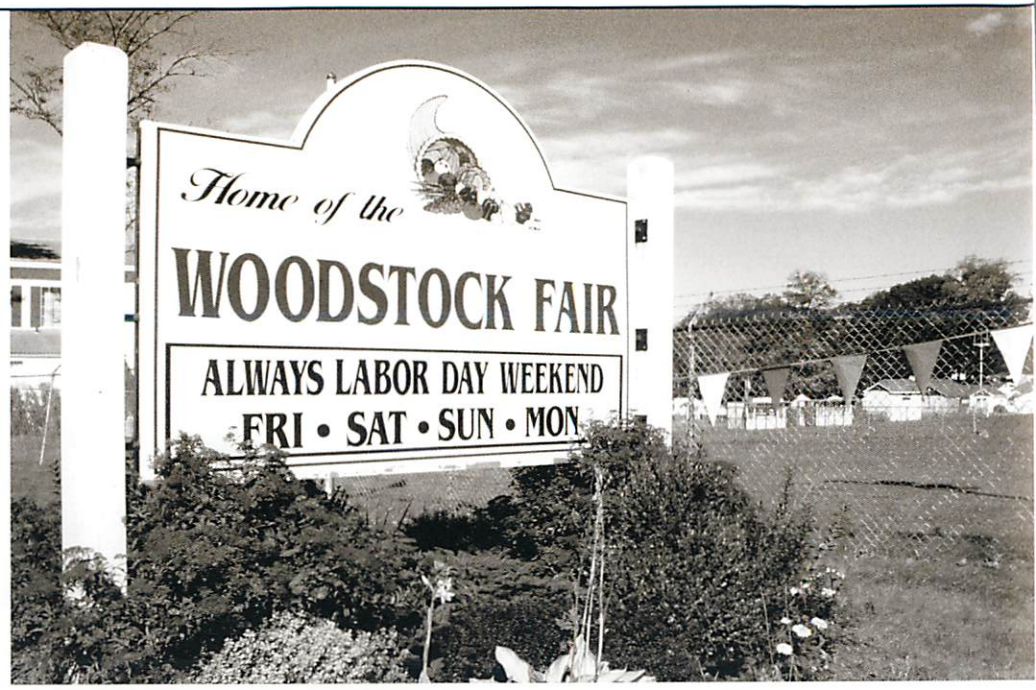
A subsequent expansion of the Walmart required not only an expansion of similar stormwater quality treatment, but also required a reduction in the overall number of parking spaces provided. This has led Waterford to revise the minimum parking ratio for retail space from four to five spaces per 100 square feet down to 2.2 spaces—about half the previous standard. In addition, new regulations have been enacted allowing commercial development adjacent to large regional shopping areas to limit the amount of impervious surface. These regulations encourage placing adjacent wetlands and uplands under a conservation easement, thus protecting these areas and also creating a buffer for nearby residential neighborhoods. Additional provisions require new development to replicate infiltration levels to predevelopment levels.

Waterford is about to complete its first year under the Phase II Stormwater discharge permit program administered by the CT DEP (see box, page 27). As part of this effort, the stormwater measures imposed on new commercial development have been extended to all forms of development. Due to the efforts of the Environmental Planner, and with the support of the Inland Wetlands Commission regulatory authority, developments are reviewed for potential direct and indirect impacts to water quality and quantity. With the inception of Phase II, the Department of Public Works has become increasingly aware of the need to participate in stormwater system design. Alterations to standard subdivision design that were allowed as part of the *Jordan Cove Urban Watershed National Monitoring Project* (page 28) are now being considered for other areas, particularly where it can be shown that the town's long term maintenance responsibility can be reduced.

(Lower left photo) An aerial view of the Crystal Mall shopping center. (Above) The Walmart stormwater wetlands and "wet pond" detention area.

As with any innovation, there is a learning curve that all departments and commissions in town need to travel. Continued monitoring and understanding of the system after construction is essential, particularly in cases of non-attainment, to ensure that additional capital improvements will be constructed correctly and achieve the desired level of pollutant removal. To this end, Waterford monitors its major watercourses twice a year, and has participated in two watershed studies, including one of the Jordan Brook watershed. Recommendations from these studies continue to be the baseline against which developments are judged.

Woodstock Town Profile



Woodstock is a town in northeast Connecticut that typifies the regional nickname of the "Quiet Corner." Woodstock is a rural community with a relatively large area of 61 square miles and a population of about 7200. UConn's 2002 remote sensing-based land cover information indicates that developed land accounts for about 8% of the Woodstock landscape, while over 70% of the town is forested.

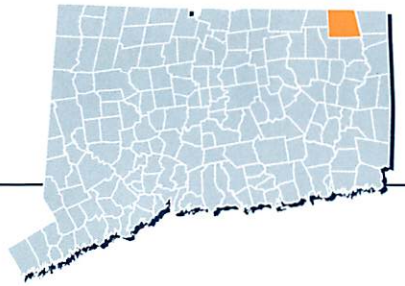
NEMO's Role

Accepted into the first year class of the Municipal Initiative, Woodstock formed a NEMO Task Force, which met with program staff in April of 2001. Local decision makers expressed concern about the preservation of open space and their rural community character in the face of increasing development, as people commit to making the long commute to Hartford or Providence. They were also interested in implementing a sewer avoidance strategy, particularly around their lakes. Based on discussions with the Task Force, a series of NEMO educational programs were delivered in Woodstock including *Linking Land Use to Water Quality*, *Open Space Planning* and *Wet Lands*. These standard workshops were supplemented with specially designed workshops on *Site Plan Review for Compliance with an Open Space Plan* and *Creating an Open Space Plan Map*. NEMO staff participated in multi-commission discussions on several occasions.

Woodstock's Actions

The town's Conservation Commission conducted a natural resources inventory which was completed in 2002 and is being continually updated. The inventory, which identifies key natural resources such as agriculture and unfragmented forest, was done entirely with volunteer effort. NEMO advised on sources of data and types of data layers that were most relevant. The inventory is entirely digital, done using GIS, and was also converted into a Powerpoint™ presentation that the Commission gave to other land use boards and civic groups. In addition, the Conservation Commission created a website dedicated to the resource inventory, where the public can view and download maps from the inventory and learn about the importance of the inventory in town planning. The website, which won a CT DEP Green Circle Award in 2003, also contains

A Focus on Conservation and Open Space Planning



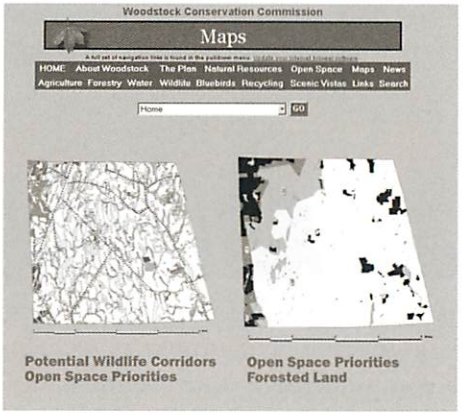
Highlights

- New natural resources inventory
- Resource inventory website
- Website receives CT DEP's 2003 Green Circle Award
- Revised open space plan
- Conservation Commission review of subdivision applications > 10 acres
- Conservation Commission of the Year Award for 2004.

a wealth of other information on topics, such as agriculture, forestry, wildlife management and natural resource protection.

A Plan of Open Space and Conservation (APOSC) was completed and formally adopted in 2001. The plan outlines the rationale and objectives of preserving open space in town. The NEMO Task Force made refinements to the plan, incorporating the latest natural resource inventory data to develop a detailed open space plan map. As part of the implementation of the APOSC, the Planning and Zoning Commission now asks the Conservation Commission to review subdivision applications over ten acres for consistency with the APOSC. This review examines any open space set-asides requested from developers at the time of subdivision for consistency with the open space plan, in order to maximize benefits to the town's open space network.

NEMO staff, along with staff from a CLEAR sister project, the Green Valley Institute, conducted a specially designed workshop on subdivision review for the Conservation Commission. Working with the Planning and Zoning Commission, the Conservation Commission formalized their subdivision review process using a worksheet



(Lower left photo) Roseland Park, Woodstock, CT. (Above) An example of the Woodstock Conservation Commission website, www.woodstockconservation.org.

that incorporates information from the resource inventory and the APOSC. This process has continued to be refined.

Planning and Zoning also completed the update of the Plan of Conservation and Development in 2002. The consultant engaged to assist the town met with the Conservation Commission and NEMO staff to discuss the process of incorporating the Open Space Plan and NEMO stormwater management principles into the Plan. Sea Grant staff associated with the NEMO Program conducted the *Wet Lands* educational workshop for the Inland Wetlands Commission, who are interested in strengthening their wetlands and watercourses buffer regulations. By invitation of the Conservation Commission, Sea Grant staff was also involved in a workshop devoted to educating lakeside property owners on the relationship between their septic tank and lawn maintenance to lake water quality. The Economic Development Commission has been re-activated and attended NEMO's *Economic Development Planning* workshop as a means to organize their efforts.

Best of all, is the impact Woodstock is having on neighboring towns. Because of its progressive open space program, town officials and volunteers have been asked to talk about their experiences in statewide conferences and in towns within the region. As a consequence, the Connecticut Association of Conservation and Inland Wetlands Commissions named Woodstock the *Conservation Commission of the Year* in 2004. This peer-to-peer interaction and recognition is perhaps the most powerful form of education, and demonstrates what can happen when outreach education catalyzes a dedicated group of local volunteers.

Salem Town Profile

Salem is a rural town in the center of the state, with about 8% developed land and much of the rest in forest. Salem is one of the three towns that comprise most of the Eightmile River watershed, a tributary of the Lower Connecticut River and the focus of a NEMO watershed initiative in the mid-1990's. Although a good deal of research was done on the natural resource issues of the watershed, town decision makers also wanted to move forward on a number of other, more local land use initiatives.

NEMO's Role

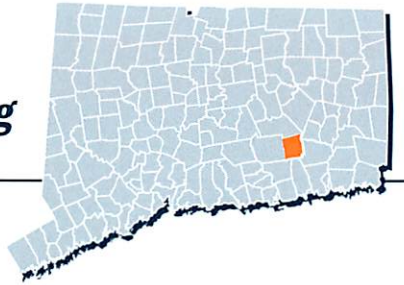
Accepted into the first year class of the Municipal Initiative, Salem formed a NEMO Task Force, which met with program staff in May of 2001. The town Conservation Commission had already embarked on a natural resource inventory, incorporating information from previous studies done as part of the Eightmile River project (see page 29). Over the next several months, the NEMO Team conducted a number of workshops, including: *Open Space Planning*, *Economic Development*, *Road Standards*, *Lot Size and Net Buildable Area* and *Forestry Practices*. The NEMO Team also reviewed drafts of the town's plans and regulations, providing advice to various land use commissions.

Salem's Actions

With the help of the NEMO Team, the town adopted the resource inventory developed by the Conservation Commission. The inventory includes a comprehensive study of the natural features in Salem, and was designed to serve as a technical backdrop to future open space planning efforts. The Planning and Zoning Commission formed a separate Open Space Plan Committee to begin crafting elements of an open space plan. The committee meets monthly and is working to incorporate and prioritize the information from the resource inventory into the open space plan. Completion is expected in the summer of 2005.

In addition to open space preservation, the town was interested in maintaining its economic viability. A workshop on economic development was sponsored by the Economic Development Commission as a kick-off to the development of an economic development plan for the town. The plan is now

Linking Open Space, Economic Development and Comprehensive Planning



Highlights

- Natural resource inventory adopted
- Open Space Plan in progress
- Economic Development Plan in progress
- Water resource-related updates to Plan of Conservation and Development
- Changes to zoning regulations allowing non-traditional parking surfaces
- Changes to subdivision regulations to incorporate "net buildable area".

complete, and the commission is working to expand the town's agricultural heritage through the encouragement of equestrian businesses. A separate "Horse Council" made up of leading business people and land owners are looking at ways to develop a system of trails that will become a part of the town's open space plan.

The Planning and Zoning Commission was interested in investigating a number of planning and regulatory issues. In their update to the town's Plan of Conservation and Development (POCD), the Commission focused on the need to protect water resources through the use of innovative site design and open space planning. For example, as part of this effort the Commission approved a change to their off-street parking requirements. The change allows for parking areas that are not paved, when the non-paved surface would "substantially enhance environmental quality." The POCD also sets goals for future road improvements and aquifer protection.

The Planning and Zoning Commission is now applying regulatory techniques that better match proposed development to the capacity of the land to accept development. After a workshop by the NEMO Team, the Commission adopted changes to their zoning regulations that incorporate the concept of "net buildable area." This regulation requires any new lot to have a total of 40,000 square-feet of land that does not contain wetlands, floodplains or steep slopes, and has soils that are suitable for on-site sewage disposal. This assures that any approved lot will meet the standards necessary for public health and the protection of water resources.

Salem's Plan identifies the preservation of rural character and the protection of public health and the environment as a primary goal.

Central Naugatuck Valley

Located in the heart of Connecticut, the Central Naugatuck Valley is a region that has a diversity of land uses, from the urban environs of Waterbury to suburban Woodbury to the more rural landscapes of Watertown and Bethlehem. UConn's 2002 land cover data show that approximately one-quarter of the region is developed, with the remaining 75% in forested or agricultural lands and wetlands. The Valley's 13 municipalities are served by a regional planning and coordination agency, the Council of Governments of the Central Naugatuck Valley (COGCNV). COGCNV, 1 of 15 state-designated regional planning organizations in Connecticut, oversees transportation and development issues within the region.

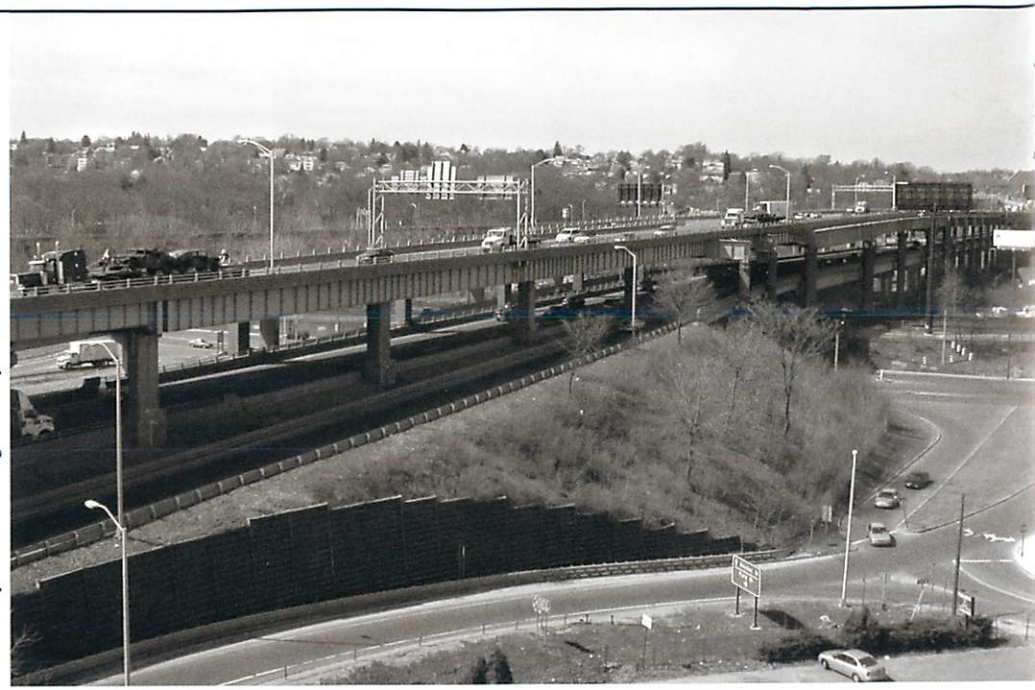


Photo courtesy of the Central Naugatuck Valley COG.

In addition, the region boasts the Pomperaug River Watershed Coalition (PRWC), a well-established organization dedicated to protecting the integrity of the Pomperaug River watershed, a 90 square mile basin that extends from the headwaters in Bethlehem to the confluence with the Housatonic River in Southbury. The two groups work closely together and COGCNV is an active Coalition partner.

NEMO's Role

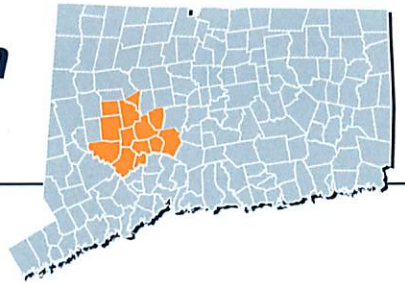
Collaboration between NEMO and COGCNV began in the late 1990's. Inspired by NEMO's *Linking Land Use to Water Quality* workshop, COGCNV wished to conduct an impervious surface buildout analysis (maps, right) for each of the towns in their region. With guidance from the NEMO Team, COGCNV staff created maps of current and future levels of impervious coverage. These maps are the centerpiece of customized workshops, developed and presented jointly by COGCNV and NEMO staff for each Valley town. As a follow-up to this collaboration, the PRWC was accepted into the Municipal Initiative in 2002. The PRWC was interested in two projects: first, continuing the impervious surface analysis begun by COGCNV for the entire watershed, and; second, developing an analysis of the watershed that would help the PRWC and local land trusts to develop a list of open space priorities for preservation of both forest and farm lands.

COGCNV & PRWC's Actions

To date the COGCNV has completed impervious surface buildout analyses for 8 of the 13 towns in the region, including all those within the Pomperaug watershed. The analysis contrasts a map estimating current levels of impervious surfaces to a map of potential future levels, estimated using CLEAR land cover data, town zoning and lot coverage regulations (box, right).

As each analysis is completed, a report is created and a workshop is conducted for town land use decision makers. At the workshops, COGCNV staff describe the

Landscape Analyses to Steer a Better Course for the Region



analysis and its results, and then NEMO staff discuss concrete steps that could be taken to reduce the impacts of stormwater runoff. The impervious surface analysis is used as a framework from which town decision makers can build an overall strategy that deals with both best stormwater management practices for existing problems, and planning and design approaches to prevent future impacts.

As a result of these analyses, several towns have implemented changes to their plans and regulations (see Watertown Profile, page 20). The PRWC has used the impervious surface and buildable lands analysis to help develop methods and criteria to determine "lands of critical value" in the watershed. These are lands that promote and protect the health of the watershed. PRWC and COGCNV develop strategies to place these valuable agricultural and forested areas under permanent protection, hence ensuring the long-term health of the Pomperaug River.

What's a Buildout?

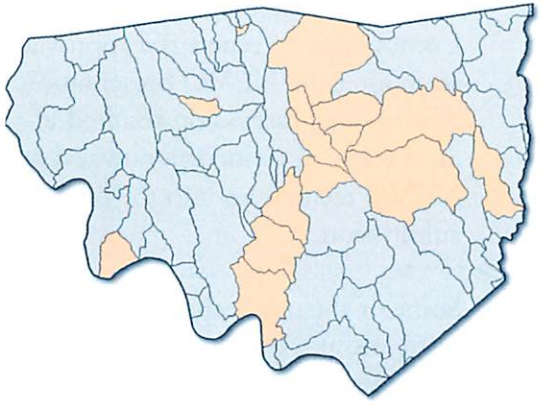
A buildout analysis is simply an estimate of how much development would occur in a community if it were to build on every available acre of land allowed by its zoning regulations. The buildout generally is not tied to a specific time frame, but is rather an "end point" scenario that might occur in some indefinite future. This analysis is sometimes used to estimate future population or number of housing units.

A buildout analysis of impervious cover is a technique developed by the NEMO Program in the early 1990's. The NEMO methodology is a four-step procedure. First, a map of **existing impervious cover** is created by using UConn/CLEAR land cover data (page 32) in combination with impervious coverage coefficients for each major land cover category. These coefficients, stated as a percentage of impervious cover, are generated from studies by NEMO and its partner projects in sample towns in Connecticut. Second, in preparation for the buildout scenario, the amount of **buildable land** is determined by subtracting existing development, regulated or unbuildable lands (i.e. wetlands, steep slopes, floodplains, etc.) and permanently committed open space from the total land area.

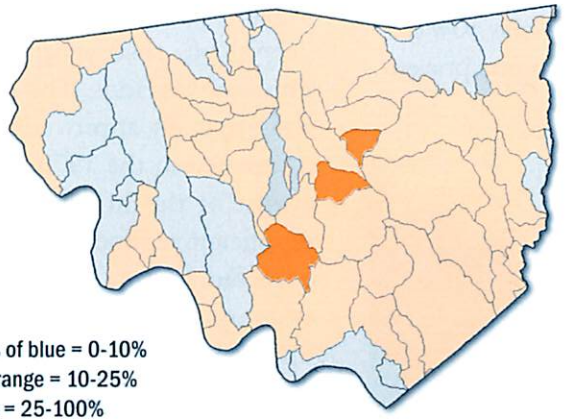
Third, the impervious coefficients are applied to the buildable lands, according to the density and coverage limits outlined in the town's zoning regulations. The application of the coefficients to the buildable lands gives an estimate of imperviousness on those lands if they were completely built out according to the town's regulations. Finally, the existing impervious cover is added to the future impervious estimates to get a **buildout impervious surface** estimate.

Since the connection between the amount of impervious cover in a watershed and the quality of the water resource has been well established through hundreds of national studies, these buildout maps give a good indication of how future development may influence the region's streams, rivers and lakes.

Existing Imperviousness



Potential Future Imperviousness



A buildout analysis of the Town of Southbury. (Map left) Existing imperviousness of local drainage basins. (Map right) Potential future imperviousness of basins.

Watertown Town Profile

Watertown, located in the Central Naugatuck Valley (page 18) and adjacent to urban Waterbury, has undergone significant growth over the last two decades. The town, roughly 30 square miles in area, has grown from 17% developed land in 1985 to 21% in 2002 (map, page 32). The Watertown landscape is typical of this part of the state, posing challenges for development in the form of wetlands, bedrock ledge and steep slopes.

NEMO's Role

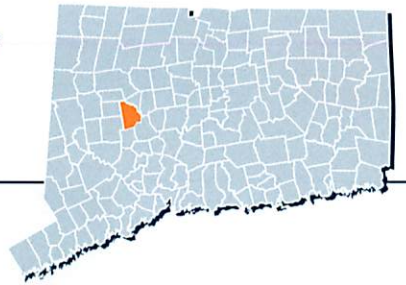
Although the Municipal Initiative has resulted in many impacts in Connecticut towns, the traditional "word of mouth" method still produces significant impacts. In 1997 and again in 1999, the Town Planner and several land use commissioners attended NEMO regional workshops. These workshops, sponsored by CT DEP and organized by the Central Naugatuck Valley Council of Governments, are conducted annually to help raise awareness of water quality issues for newly elected or appointed commissioners. In this case, the workshops resulted in the Watertown Town Planner inviting NEMO to present the *Reducing Runoff* presentation at a town meeting, with all the town land use commissions present.

Watertown's Actions

Inspired by the "distributed infiltration," or "low impact development" techniques highlighted during the *Reducing Runoff* workshop, the town has applied these techniques in several new subdivisions. The Breezy Knoll subdivision is sited on a high elevation site that formally served as an agricultural field. The site drains to a local lake and associated wetlands, and consists of areas of steep slopes, shallow depth-to-bedrock soils and wetlands. The subdivision was originally approved and partially completed in the 1970's. As a consequence of the difficult site conditions, significant sedimentation of the lake occurred and the developer incurred clean up costs in excess of $20,000. Phase II of the subdivision was approved in the late 1980's, but after ten years of inactivity the approval was set to expire. The developer came back to the Planning and Zoning Commission to renew the approval soon after the NEMO presentation. The ensuing discussion resulted in an agreement to incorporate several NEMO techniques into the new subdivision.

Some of the new techniques incorporated into the Breezy Knoll subdivision include curbless roads, grassed swales, pervious

Pursuing "Low Impact Design" for Residential Subdivisions



Highlights

- Two major "low impact" subdivisions with narrow roads, grassed swales, pervious driveways, lot clearing limits and conservation areas
- Zoning changes to allow alternative stormwater controls
- Subdivision changes to create seven-step "water friendly" site design approach.

driveways, lot clearing limits and permanent conservation areas to protect wetlands on the site. The older curb-and-gutter section of the development has been redesigned to partially drain to the swales, to help control sedimentation to the downstream lake.

The successes of these techniques have resulted in their replication in other subdivision projects in town. The Joshua Town subdivision was approved just subsequent to the town's NEMO workshop. According to the Town Planner, the land use commissions were initially uncomfortable with the application, which included low impact elements like narrower roads, swales and a vegetated cul-de-sac center. As with the Breezy Knoll subdivision, the site contains very steep slopes, wetlands and shallow-to-bedrock soils with bedrock outcrops. The site also drains to a lake that is cherished locally for recreational purposes.

Armed with a better understanding of the issues provided by NEMO, the commissions approved all of the proposed alternative stormwater controls, including a strip of porous pavers around the inside of the vegetated cul-de-sac, to allow for the wide turns of emergency and road maintenance equipment.

Innovative design can help reduce the impacts of impervious surfaces on water resources. (Lower left photo) A town road with reduced pavement width and curbless roads. (Above) A cul-de-sac with a vegetated center island in the Joshua Town subdivision.

Driven partly by these successes and the interest to codify these principles into their regulations, the Planning and Zoning Commission made significant changes to their planning and regulatory documents. Prior to the NEMO workshops, the Planning and Zoning Commission required the use of a mechanical stormwater treatment device. At present, they will allow alternative methods to provide sediment removal (i.e. swales, bioretention) if the engineer supplies back-up documentation that the alternative will work. These vegetation-based alternatives have been shown to be more effective, and generally easier to maintain, than mechanical devices. Current subdivision regulations lay out a seven-step approach to site design, based on NEMO principles, that includes such considerations as fitting the development to the natural grade, preserving and replicating the natural hydrology of the site, minimizing impervious surfaces and developing a stormwater management plan.

East Haddam Town Profile

East Haddam is a rural town in central Connecticut that over the past five years has experienced significant residential development pressure. According to the CLEAR land cover data, East Haddam increased its developed lands by over 11% from 1985 to 2002. The town staff consists of one full-time land use administrator and a half-time zoning/ wetlands compliance officer. Because of the work load on both the staff and the land use commissions, the town had not been able to update their comprehensive plan in over ten years and had a long list of needed changes to their regulations.

NEMO's Role

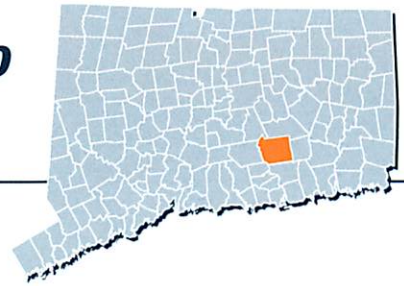
It was in this climate that the town asked to participate in NEMO's Municipal Initiative in 2003. East Haddam chose to address a broad range of planning issues, from a community resource inventory to updated regulations to an overhaul of the Plan of Conservation and Development (POCD). Over a three month period, the NEMO Team provided five educational workshops for multi-commission audiences. Topics included: *Roles and Responsibilities of Land Use Commissions*, *Writing Land Use Plans and Regulations*, *Reducing Runoff*, *Conducting a Natural Resource Inventory* and *Natural Resource-Base Planning for Watersheds*. A special workshop on subdivision design was also held, in collaboration with the Milone and MacBroom engineering firm. The NEMO Team then worked with the NEMO Task Force and various commission subcommittees to provide feedback on regulation changes initiated by the town.

East Haddam's Actions

East Haddam's immediate concern was a perceived inadequacy of its subdivision and zoning regulations. With recommendations from NEMO workshops, the Planning and Zoning Commission adopted new subdivision regulations using the "net buildable area" concept to better match the size of the lot to the capacity of the land to accept development. These regulations require an inventory of natural resources and a "yield plan" of the parcel in order to determine the number of lots allowed. In this way, both traditional and conservation subdivision designs better reflect the "carrying capacity" of the land.

The Planning and Zoning Commission also addressed the road standards and stormwater management sections of the regulations. Road width requirements for local roads were reduced from 32 to 18 feet,

Updating Land Use Regulations to Protect Water Resources and Foster Community Character



and the use of curb-and-gutter drainage was discouraged. All proposed projects in town require a thorough stormwater management plan that addresses both water quantity and quality. The recommendations for dealing with stormwater mirror those found in the new Stormwater Quality Manual published by the CT DEP. East Haddam was the first town in Connecticut to refer to this manual as guidance for future development. In addition, the Inland Wetlands and Watercourse Commission increased the upland review area from 75 to 100 feet, providing further protection to the town's water resources.

East Haddam is also implementing new parking regulations that allow for innovative stormwater management such as on-site bioretention and techniques to reduce overall parking requirements. These techniques include shared parking in commercial areas, and multi-functional landscaping that both renovates stormwater runoff and provides aesthetic benefits. Creation of a Village District is being studied for the East Haddam village area. This designation will allow more flexibility than standard zoning practices, while protecting the unique historic character of the area.

With its immediate concerns addressed, town land use commissions are now turning to longer term planning issues.

(Lower left photo) Inter-commission meeting to discuss planning issues in town. (Above) Horses graze in an East Haddam field.

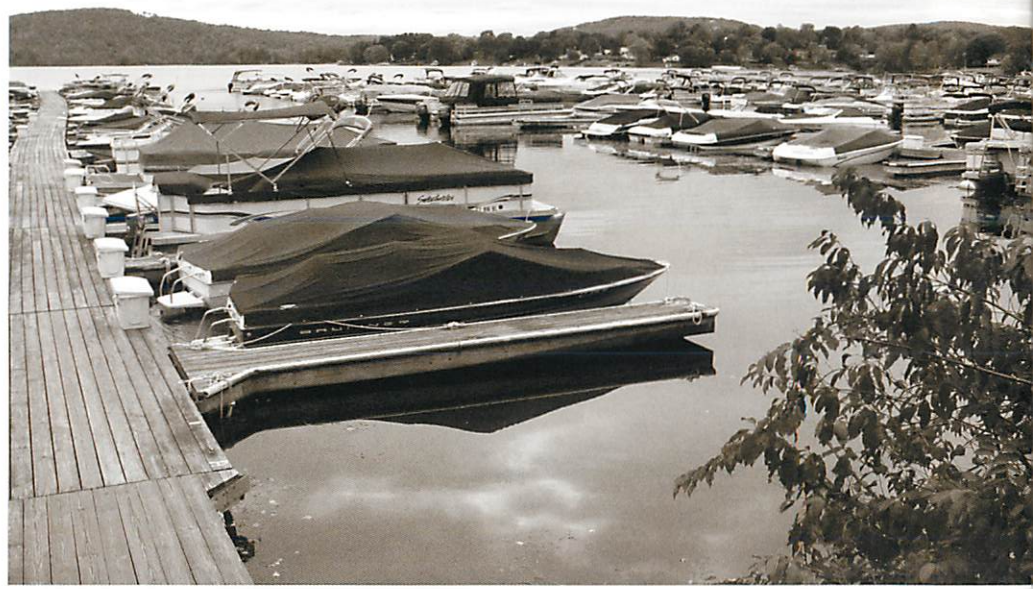
The Conservation Commission is conducting a resource inventory of the town using geospatial information available from a statewide database, as well as land cover data produced by NEMO's parent organization, CLEAR. The Planning and Zoning Commission is working with NEMO partners to develop an interactive buildout analysis model using CommunityVIZ™ software (produced by The Orton Foundation). This model will determine the ability of a property to support housing units, using the recent regulation changes. From this information a watershed-based plan will be crafted, setting development goals for individual sub-regional watersheds in town.

Highlights

- Subdivision regulations changed to base density on "net buildable area" approach
- Road standards changed to reduce minimum road width and encourage curbless roads
- First town in state to link subdivision regulations to new state Stormwater Quality Manual
- Change in wetlands regulations to increase upland review zone to 100 feet
- New parking regulations being developed
- Creation of a Village District being considered
- New natural resource inventory being conducted
- Community buildout analysis completed, as part of watershed plan.

Candlewood Lake Authority

The Candlewood Lake Authority (CLA) is a local government agency that is dedicated to the long-term health of Connecticut's largest lake. In 1972, the member municipalities of the CLA—Brookfield, Danbury, New Fairfield, New Milford and Sherman—each adopted an ordinance giving the CLA its powers. The CLA acts as a technical resource focused on the Lake and its 26,000-acre watershed, and leads regional efforts to protect the lake through a variety of approaches, including assisting communities with revisions to town plans and regulations.



In January 2000, the CLA obtained a grant through the CT DEP to review, and make recommendations to improve land use regulations relative to the well-being of Candlewood Lake. An advisory committee, comprised of designees from each member town's chief elected official, was assembled to assist the CLA on this project. Other participants in the project included the Housatonic Valley Council of Elected Officials, CT DEP, the Natural Resources Conservation Services and a consultant.

NEMO's Role

In 2001, the CLA was accepted into the Municipal Initiative to assist in the above project. The NEMO Team provided outreach education to town land use commissions and the general public in the Candlewood Lake watershed. The workshops included *Linking Land Use to Water Quality* and *Clean Waters*, a presentation focused on homeowners.

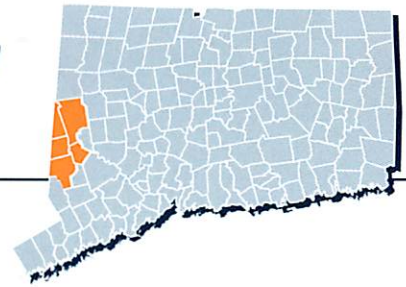
In conjunction with the workshops, a GIS analysis of impervious cover was performed for the watershed. The analysis used an ArcView® tool called the Impervious Surface Analysis Tool (ISAT) (page 32), developed by the NEMO Team in collaboration with NOAA's Coastal Services Center. ISAT allows a community to estimate the amount of impervious surfaces in a watershed and its subbasins, using land cover information. This, in turn, allows resource managers to assess the potential impacts on water quality from existing land use practices.

NEMO staff also participated in a Special Advisory Committee to assist the CLA in its review of member towns' land use plans and regulations. The Advisory Committee crafted an Action Plan for the watershed, from which specific implementation measures were proposed. NEMO assisted in the preparation and delivery of a presentation reviewing the recommendations of the Action Plan, which was given to land use boards in member towns.

CLA's Actions

The CLA Action Plan reviewed the plans and regulations in their five member towns and made specific recommendations on how

Promoting a Uniform Multi-town Approach to Water Protection



Highlights

- Impervious surface analysis of lake watershed
- New Lake Action Plan with recommendations on lake protection, including creation of Lake Protection Zone overlay
- Zoning regulations changed in two towns to include lake overlay zone, and in process of being changed in two more towns
- Wetlands regulations changed in one town to increase upland review area to 200 feet.

to protect the lake. These recommendations included standards for stormwater management and impervious surface coverage in both zoning regulations and site design requirements.

The Action Plan specifically calls for a Lake Protection Zone (LPZ), an overlay zone for land uses immediately around the lake. (An overlay zone such as the LPZ does not supplant existing zoning; rather, it applies additional standards on top of the current zoning.) In order to protect water quality, the LPZ sets impervious surface limits, requires buffers around water resources and sets minimum lot area requirements. The LPZ also incorporates innovative standards that allow for flexibility in site design. For example, if the lot configuration or existing structures limit the amount of new impervious cover allowed, the owners can exceed the limits if they provide for other water quality management practices (see the following examples).

From the Candlewood Lake Action Plan language for a Lake Protection Zone:

Regulatory Buffers and Minimum Lot Area Requirements: Exceeding the Impervious Surface Limit

- Replace an existing lawn with a vegetative buffer strip of natural vegetation designed to absorb/treat stormwater
- Remove a beach area and replace it with natural shoreland vegetation
- Remove an accessory building to compensate for a home addition
- Install on-site systems for retention and treatment of stormwater.

To date, the towns of New Milford and Brookfield have adopted the LPZ into their zoning regulations, setting standards in this zone for impervious surface coverage and management of stormwater runoff. Sherman is looking to follow suit and has adopted an increased upland review area (regulated by the Inland Wetlands Commission) to 200 feet, making it consistent with other CLA towns. New Fairfield, working with a consultant, has included recommendations from the CLA Action Plan in the update of their Plan of Conservation and Development; they are currently working on specific language to adopt the LPZ and require stormwater management plans for new development.

Stonington Town Profile

Bordered by the Pawcatuck River on the east, the Mystic River on the west and 30 miles of coastline along Long Island Sound, the Town of Stonington has a longstanding relationship to its water resources, from whaling and commercial fisheries to recreational boating and tourism. Stonington is a rural agricultural and residential region, with four distinct village centers: Stonington Borough, Mystic, Lord's Point and Mason's Island. The ideal location of the town has drawn a significant increase in development in recent years, with developed land comprising nearly 20% of the town, an increase of 24% from 1985 levels.

In part because of this increased population, CT DEP has identified the town as a Stormwater Phase II community (see box). As a prelude to addressing these issues with their regulations, the land use commissions had formed a steering committee to begin the review of their Plan of Conservation and Development (POCD).

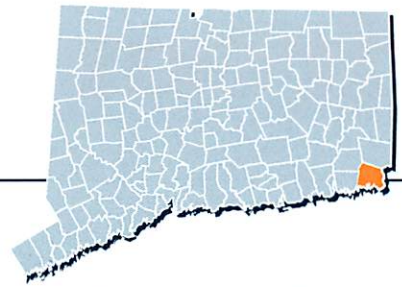
NEMO's Role

In the fall of 2002, the Town of Stonington asked NEMO to provide the *Linking Land Use to Water Quality* workshop as part of their POCD update. Soon after this workshop, the town applied and was accepted into the Municipal Initiative, using the existing POCD steering committee as its NEMO Task Force. The town set out on an ambitious work plan: a resource inventory and buildout analysis; a significant update to the POCD focusing primarily on stormwater management; revisions to zoning, subdivision and inland wetland regulations; and, where practical, finding demonstration sites for stormwater best management practices. NEMO's *Open Space Planning*, *Reducing Runoff* and *Economic Development* workshops were presented to the land use commissions and the general public in several sessions. NEMO Team members have also reviewed existing plans and regulations.

Stonington's Actions

The NEMO Task Force was broadened to become the town Stormwater Management Study Group, comprised of members from the Planning and Zoning, Inland Wetland and Watercourse, Conservation and Shellfish Commissions as well as town staff, CT DEP's Office of Long Island Sound and Stonington's state representative. The Study Group identified a number of key

Ramping Up for the Stormwater Phase II Program



issues with their existing regulations. They recommended a number of strategies that would reduce the amount of impervious surface created during new construction, and called for flexibility in determining requirements for parking, road standards, driveway widths and other impervious elements of the landscape.

The Study Group's recommendations are being incorporated into the town's POCD. Key among these proposals is an increased focus on water quality, stormwater management, open space preservation and the conservation of the community's cultural and natural resources. The POCD calls for development that both considers and respects the land's natural capability to support the proposed new use. Two methods of accomplishing this goal are proposed, a "buildable land regulation" that excludes lands with severe limitations (steep slopes, wetlands or floodplains) from development, or "soil-based zoning," which matches the amount of development to the capacity of soils on the site to accept that development. In addition to these stormwater and water quality strategies, the POCD calls for a number of new strategies to preserve open space: the establishment of a Stonington Land Trust, requiring "open space developments" in certain areas of town and acquiring land to connect existing preserved areas and to provide coastal access.

(Lower left photo) Stonington town staff tour Jordan Cove Research Subdivision in Waterford, CT. (Above) Members of Stonington's Stormwater Task Force.

The Stormwater Management Study Group, renamed the Stormwater Task Force, is now focusing its effort in three areas. First, thanks in part to a grant from CT DEP, the town is investigating the feasibility of creating a "stormwater utility" to assist the town in funding existing and future stormwater infrastructure improvements. (Stormwater utilities, which are used in a number of states nationwide, have not been used in Connecticut to date). Second, the Task Force will be working with town staff on a new Public Improvement Standards manual that will take a unified approach to major public infrastructure elements such as roads and stormwater management. The use of alternative stormwater design (such as water quality swales and rain gardens) will be encouraged. Third, the Task Force will be focusing on raising public awareness of stormwater issues through a public education program, with particular emphasis on school-aged children.

Highlights

- Comprehensive plan changes to adopt recommendations of town stormwater study group, including stormwater practices, open space preservation and "buildable land" analyses
- State-funded feasibility study on creating the state's first town stormwater utility
- New public improvements manual unifying infrastructure and stormwater standards
- Public awareness campaign as part of Stormwater Phase II management plan.

Stormwater Phase II

The Stormwater Phase II Program is part of the federal Clean Water Act that regulates operators of small municipal separate storm sewer systems in "urbanized areas" as defined by U.S. Census data. About 113 of 169 towns in Connecticut meet this definition. These towns were required to register for a Phase II permit with CT DEP in 2004, and have five years to implement a stormwater management plan with specific plan elements and meeting "measurable goals."

Selections from the NEMO Files

Jordan Cove Urban Watershed National Monitoring Project, Waterford, CT

Soon after receiving NEMO training, the town of Waterford was approached by the Environmental Protection Agency (EPA) and CT DEP to host a novel stormwater research project. The proposal was to build the first research site that would focus exclusively on suburban development. This research project, termed the Jordan Cove Urban Watershed National Monitoring Project, focused on a unique public/private partnership to incorporate and monitor the effectiveness of a variety of stormwater best management practices (BMPs) in the Glen Brook Green Subdivision.

The 18-acre subdivision consists of two parts. The traditional section uses a standard lot layout, 24-ft asphalt roads with curb and gutter drainage collection and turf landscaping. The second section uses a variety of low impact design techniques, such as a clustering of lots, community open space, a 20-ft wide concrete-paver road with a grassed-swale drainage system, a cul-de-sac with a vegetated center island for the retention and infiltration of runoff, and shared driveways with a variety of pervious pavements. The study was constructed so stormwater runoff from the site could be monitored during all phases of construction and for several years after completion.

(Left photo) Sunken, vegetated cul-de-sac center accepts and treats runoff. (Right photo) Individual homes at Jordan Cove have pervious driveway materials, rain gardens handling roof runoff and "no mow" zones in the back yards featuring native vegetation.

The transition from the conventional subdivision to the "low impact" subdivision at the Jordan Cove Project is marked by the change in the road surface from asphalt and curbs to pavers and grass swales.

Although the results from the Jordan Cove study are still coming in, current monitoring data are extremely favorable. The low impact section of the development has shown less than half the stormwater runoff volume as compared to the traditional development. In fact, early results show that during storm events the low impact sites seem to be mimicking the natural hydrology of the area. This reduction in runoff means fewer pollutants getting to the nearby stream and less impact from increased volume of water coming off development.

From Wild Rivers to Parking Stalls,

Progress in Protecting Water Resources

One solution to the problem of too much parking: Westfarms Mall in West Hartford and Farmington features an engineered grass overflow parking lot, to promote infiltration of stormwater.

Parking Utilization Study

Many parking standards are based on peak utilization periods, such as the week before Christmas. As a result, most parking lots are only half-full during the majority of the year. The Litchfield Hills Council of Elected Officials and the Northwest Council of Governments, in collaboration with the NEMO Program, jointly sponsored a two-phase parking study conducted by Fitzgerald and Holiday, Inc. Phase I of the study focused on a detailed parking assessment of northwestern Connecticut. Predictably, the study found that the majority of lots were underutilized, with only 45% of the parking spaces occupied when surveyed. This trend was even more apparent in "big box" retailers who, on average, had only 25% of their lots occupied. Phase II of the study suggested specific strategies and standards, including model regulations, for parking requirements that more realistically match the parking needs of specific land uses. It also recommended considering alternative approaches, such as bioretention and pervious pavements, for reducing the volume and improving the quality of stormwater from parking lots. A link to the complete study can be found on the Reducing Runoff section of the NEMO website. ❋

The Eightmile River Story

The Eightmile River watershed drains into the lower Connecticut River, and comprises a 63 square mile area of unusually intact forest and agricultural lands within the towns of East Haddam, Lyme and Salem. In 1993, the NEMO Program, working with UConn's Cooperative Extension Forestry Program and the Connecticut Chapter of The Nature Conservancy, began an educational effort targeting both municipal decision makers and private property owners within the watershed. Through the formation of an Advisory Committee made up of local town leaders and non-profit organizations, the Eightmile River Watershed Project characterized the watershed using GIS resource inventories and local expertise. The project led to a renewed commitment from the three constituent towns to protect this uniquely pristine watershed. This was crystallized by a tri-town Conservation Compact signed by the three First Selectmen, in which the towns agreed to work together to grow in a way that protects the high-quality resources of the watershed. Since the signing of the Compact, Eightmile towns have formed open space committees, initiated local land trusts and protected hundreds of acres of forest and farmlands. Additionally, two of the towns participated in the NEMO Municipal Initiative (see Salem, page 16, and East Haddam, page 22). Under the guidance of The Nature Conservancy, the Advisory Group has requested that the watershed be placed under the federal Wild and Scenic Rivers program. As of 2004, an in-depth study of the watershed, funded by Congress, is being conducted as a first step for Wild and Scenic designation. ❋

First Selectmen of Lyme, East Haddam and Salem sign Watershed Compact in 1997. (Photo right) Chapman Falls, near the headwaters of the Eightmile River in Devil's Hopyard State Park.

Beyond Local Impacts

The all-important changes at the town level are not the only impact that the NEMO Program has had in Connecticut.

At the University of Connecticut, NEMO has been working with the new Office of Environmental Policy to help promote environmentally sound development and building practices as the University continues its unprecedented expansion. For instance, in March of 2003 the Environmental Policy Office and NEMO co-hosted an educational workshop on innovative stormwater management for current and aspiring UConn contractors. In addition, NEMO was the model and foundation for the UConn Center for Land Use Education and Research (CLEAR), approved as a University Center by the Board of Trustees in April 2002 (see NEMO Family, right).

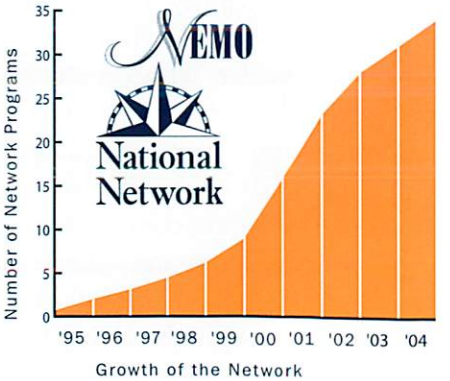
State

At the state level, NEMO programs and references have been incorporated into many important state plans and policy documents, including the Plan of Conservation and Development, Nonpoint Source Plan, Coastal Nonpoint Source Plan and the new state Stormwater Quality Manual. As a continuation of its longstanding partnership with CT DEP, NEMO will be assisting with statewide training on the Stormwater Manual during 2005.

National

At the national level, NEMO has made its way into several high-profile policy documents and reports, including the recently released report of the 2004 U.S. Commission on Ocean Policy, and a General Accounting Office report on incentives to promote better land use. NEMO principals also have been a leading force for arguing the importance of educating local land use officials in publications covering many disciplines and ranging from the *Journal of Extension* to the *Planning Commissioners Journal* to the *Journal of Photogrammetric Engineering and Remote Sensing.*

However, it is through the **National NEMO Network** that the program is having its greatest national impact. The Network, which now numbers 34 programs in 32 states, is a confederation of programs adapted from the original Connecticut model. Coordination and leadership of the Network is provided by the UConn "Hub," a staff of two people working closely with the Connecticut Program. For more information on the Network visit the NEMO website.



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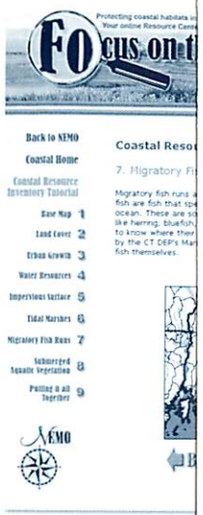

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nemo.uconn.edu/co

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The NEMO Family

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Visit the CLEAR website at: **clear.uconn.edu**

CLEAR Programs:

- CT NEMO Program
- National NEMO Network
- Geospatial Technology Program
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- Forest Stewardship Program

GEOSPATIAL TECHNOLOGY PROGRAM
technical education & training

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The Green Valley Institute (GVI) is a regional program that was formed in 1999 as a partnership between UConn Cooperative Extension and the Quinebaug-Shetucket National Heritage Corridor, an area that is comprised of 27 communities in northeastern Connecticut and southeastern Massachusetts. GVI exists to help Heritage Corridor communities and citizens sustain their environment and quality of life while growing their economies. GVI targets audiences who most influence land use in the Corridor, including private landowners, municipal boards and commissions, Corridor land trusts and local builders/contractors. GVI schedules both regular training and special education programs on a variety of subjects, many in concert with other CLEAR programs.

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thelastgreenvalley.org/gvi

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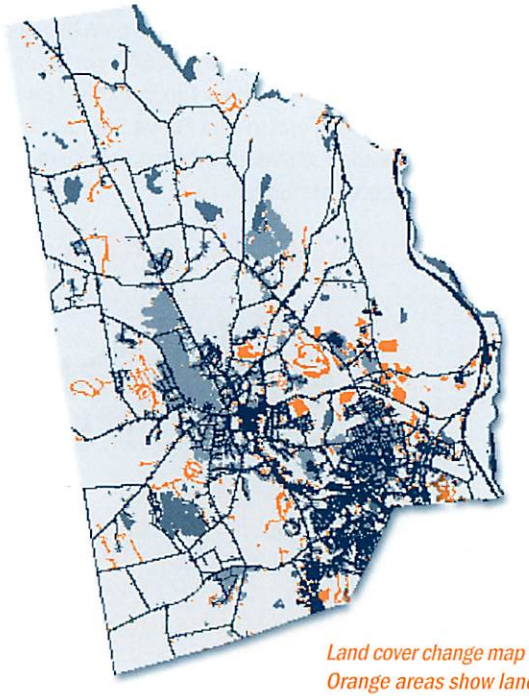
Bringing Science & Technology

Times have changed since 1991, and with it NEMO's use of technology. At the time of NEMO's inception, remote sensing (RS) was virtually unknown and unused at the town and even the state level within Connecticut. Geographic Information System (GIS) technology was just emerging from its infancy as a costly and ungainly technology. Today, the use of computers and geospatial technology has become common in town halls across the state. However, the program's use of geospatial technology has not been a linear evolution from simple to complex applications. Rather, as advances in geospatial science and technology enable more approaches, NEMO has developed a wider array of informational options to enhance the workshop-based educational "toolbox" made available to communities. Some of the more recently developed research and applications are shown here.



Land cover change map for Watertown. Orange areas show land that has been developed since 1985.

Connecticut's Changing Landscape

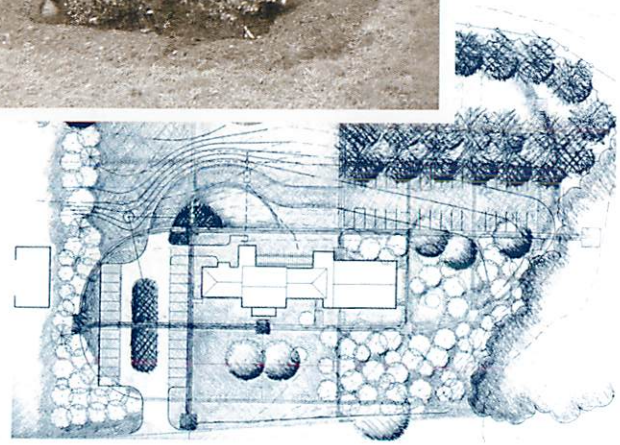
clear.uconn.edu/projects/landscape/index.htm

▲ ***Connecticut's Changing Landscape*** (CCL) is the first UConn project developed under the CLEAR banner. By creating four dates of land cover spanning a 17-year period, the CCL project made it possible, for the first time, to quantify and view land cover change, particularly the growth of developed land. The change maps (see above) are eye-opening for many people, giving them a previously unattainable picture of the recent development history of their town or watershed. (Actual change maps are in full color.)

Haddam Demonstration Project

nemo.uconn.edu/case_studies/demosite.htm

▼NEMO is also in the midst of a long-term project to turn the Middlesex County Cooperative Extension Center (NEMO headquarters) into a stormwater management demonstration site. In an attempt to "practice what we preach," a number of design-oriented stormwater practices are in various stages of installment, including a rain garden accepting roof runoff (photo below), a demonstration "green roof" and pervious parking stalls.



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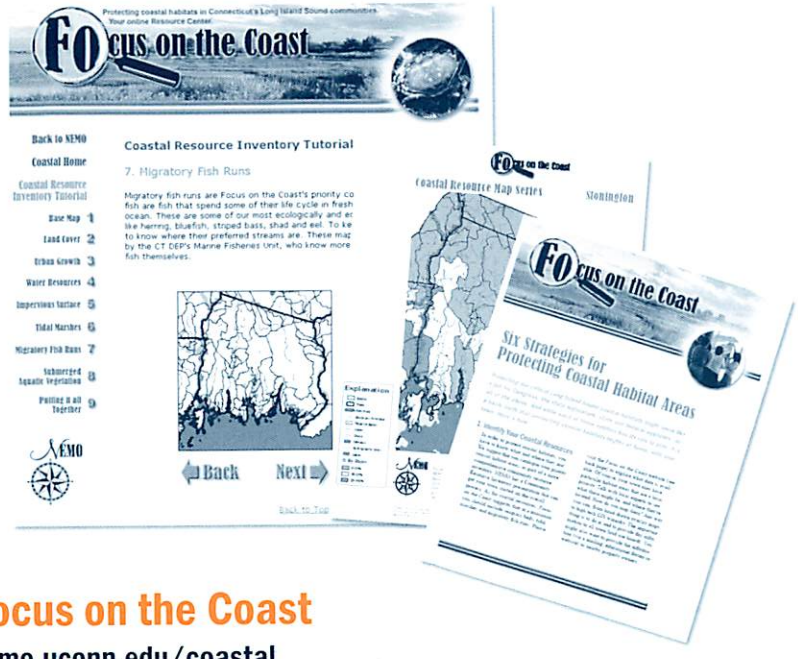


Focus on the Coast

nemo.uconn.edu/coastal

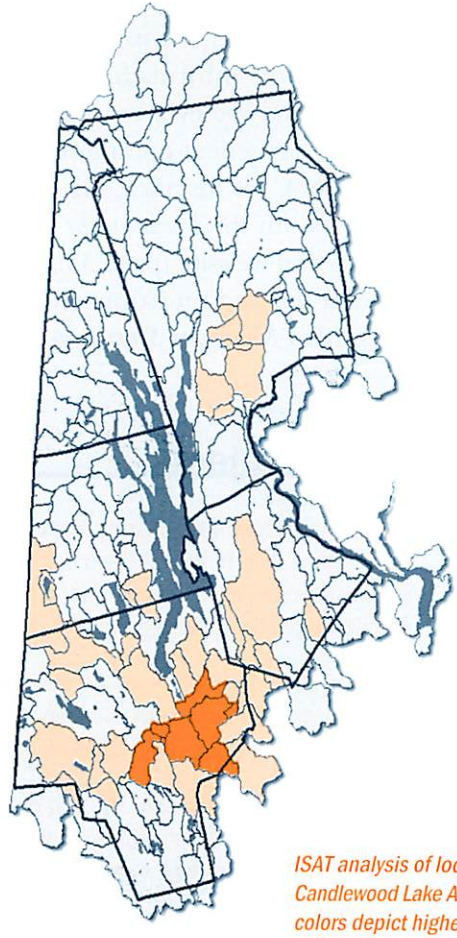
▲ ***Focus on the Coast*** is a recently completed multi-media education project designed to address the intersection of urban land uses and priority coastal habitat areas along Connecticut's coast. The goal is to educate local land use decision makers about key coastal resources, put the resources in the context of other local information, and encourage natural resource based planning that incorporates these coastal resources. The *Focus on the Coast* website provides additional cutting-edge geospatial resources for the educational workshop, including a Coastal Resource Inventory tutorial and a Mapping Station with three ways for users to view and analyze GIS data.

Focus on the Coast is a collaboration between the University of Connecticut NEMO Program, the Connecticut Sea Grant College Program, the Nature Conservancy Connecticut Chapter and the CT DEP Office of Long Island Sound Programs, and was funded by the NOAA Coastal Services Center.

Impervious Surface Research & Tools

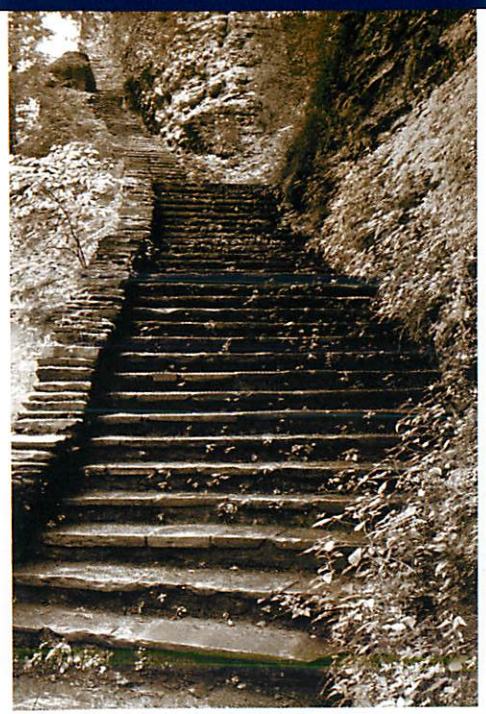
nemo.uconn.edu/impervious_surfaces

◣ Impervious surface coverage has been proven to be an important and useful indicator of the impacts of urbanization on water resources. NEMO and CLEAR have continued to focus on new tools and research for measuring and estimating impervious coverage, including the development (with NOAA) of the Impervious Surface Analysis Tool (ISAT), a GIS "plug-in" tool designed to estimate the percent area of a watershed (or another user specified geographic area) that is covered with impervious surfaces. A host of information including ISAT and other CLEAR tools and research, is contained on the new NEMO Impervious Surfaces website.



ISAT analysis of local watersheds within Candlewood Lake Authority towns. Warmer colors depict higher levels of impervious surface coverage.

Future Directions



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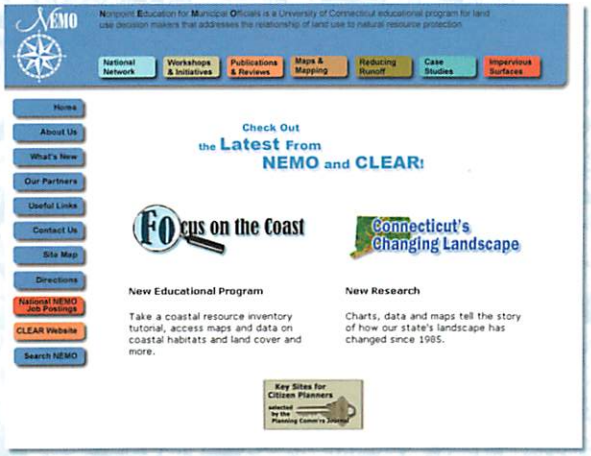
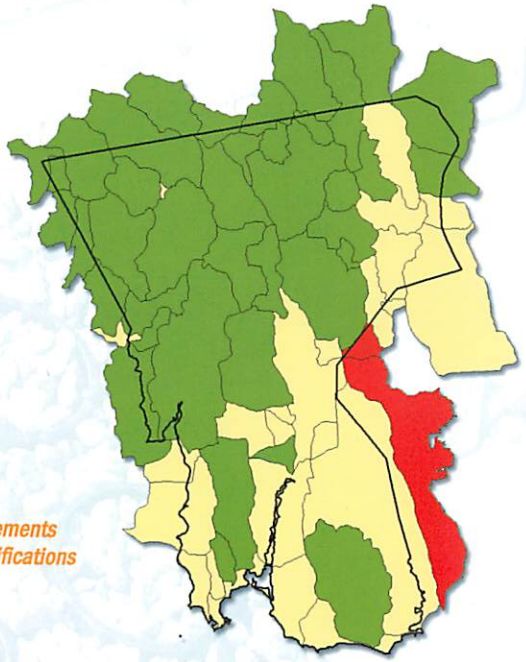
▶A list of all the educational offerings of the NEMO Program, along with a brief description of each workshop can be found on the **Workshops & Initiatives** section.

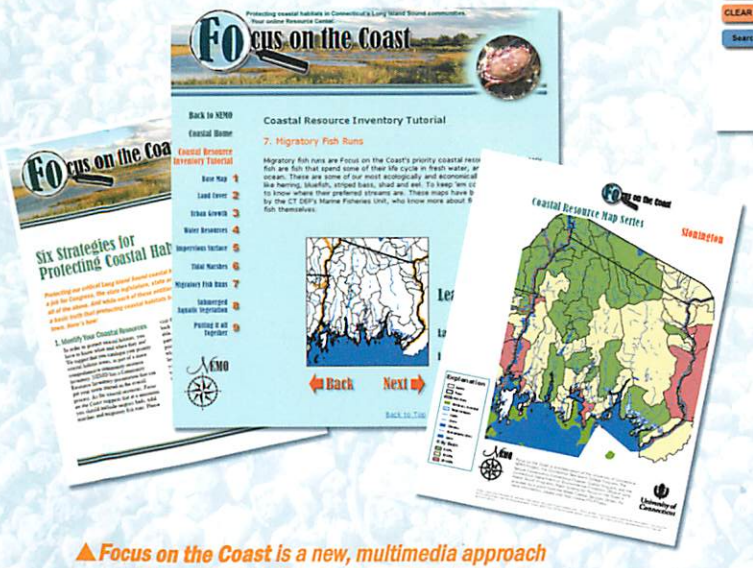
▲A variety of NEMO publications can be found on the **Publications** section of the website that provide topical and technical background to NEMO workshops.

▲UConn is the home of the National NEMO Network. The **National Network** section provides information and resources for this unique collaboration of NEMO programs in 32 states.

nemo.uconn.edu





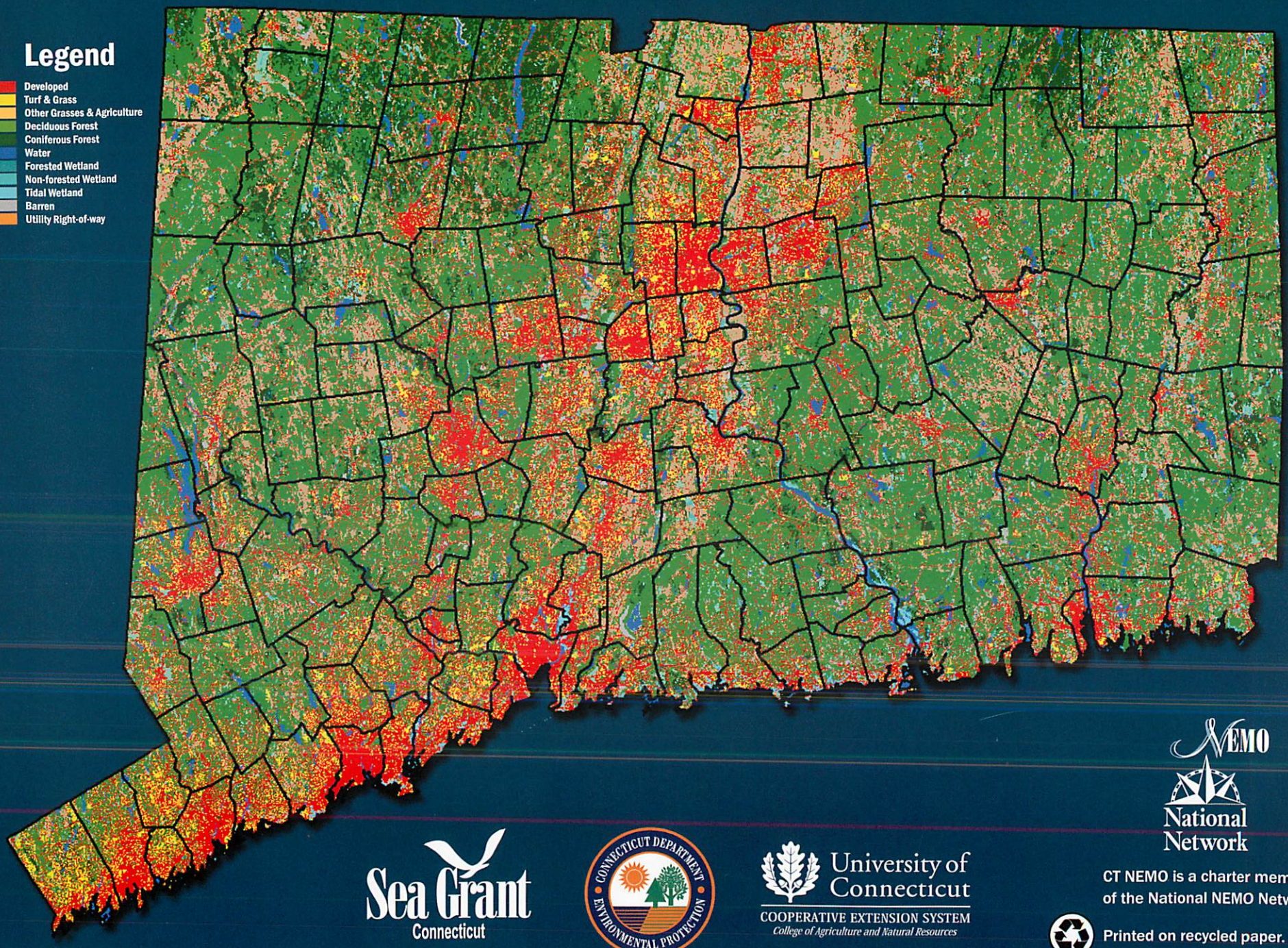


▲**Focus on the Coast** is a new, multimedia approach to education—using the Internet to support traditional Extension educational workshops.

▼**The Reducing Runoff** section provides the specifics for porous pavements and alternative stormwater design. Find case studies, examples, specifications and vendor contacts for all your stormwater needs.

▲For everything you ever wanted to know about impervious surfaces, visit the **Impervious Surfaces** section. Follow the most recent literature and learn about the different ways to measure and estimate this important indicator of water quality.

2002 Land Cover Map of Connecticut



Sea Grant
Connecticut

Connecticut Department of Environmental Protection

University of Connecticut
Cooperative Extension System
College of Agriculture and Natural Resources

NEMO
National Network

CT NEMO is a charter member of the National NEMO Network.

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